

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

DESCRIPTIONS OF THE LARVAE OF SOME
PREDACIOUS WATER BEETLES
(COLEOPTERA: DYTISCIDAE)

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During our occasional local collecting trips in the past few years we have been searching for the immature stages of aquatic beetles belonging to genera whose larvae have not been described previously or whose larvae were described only briefly. As a result, we have obtained the larvae of *Agabetes acuductus* (Harris) and *Matus bicarinatus* (Say) and the larva and pupa of *Laccornis difformis* (LeConte). Descriptions of the immature stages of these species follow; bionomic notes are included. The illustrations for this paper were prepared by Mr. Michael Druckenbrod, Smithsonian Institution staff artist.

Genus *Agabetes* Crotch

Agabetes Crotch, 1873:401.

Agabetes is a monotypic genus occurring primarily in shaded woodland ponds although specimens occasionally have been collected in unshaded ponds in or adjacent to wooded areas. The only species known in the genus, *Agabetes acuductus*, is recorded from southern Canada to Florida on the east coast and to Michigan, Missouri, and Arkansas in the midwestern United States.

Agabetes acuductus (Harris)

C[*olymbetes*] *acuductus* Harris, 1829:164.

Bionomics: Sherman (1913) discussed the habitat of *A. acuductus* and reported that the species is wingless. However, Leech (1942) dis-

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agreed with Sherman because all of the specimens he dissected were fully winged. Young (1954) reported that observations indicated that *acuductus* is never taken at light and is found in woods ponds that are drying up and after other species have migrated to other situations; thus suggesting that *A. acuductus* is flightless. Jackson (1956) reported that in specimens of *A. acuductus* sent to her by Dr. Young, "The Flight muscles are underdeveloped and the metatergum is reduced, yet the wings which must be useless for flight are of full size." We can now report that specimens of *A. acuductus* can fly because they were attracted in considerable numbers to an ultraviolet light operated in a forest close (100 ft. to 200 ft. distant) to a woodland pond at Easton, Maryland. These specimens were collected at a time when the pond was drying up and the beetles may have been forced to fly or die. Although we believe that *A. acuductus* is attracted rarely to ultraviolet or other lights and that specimens probably do not fly far, the fact that they can fly is significant to their distribution and survival.

The majority of the larval specimens of *A. acuductus* that we collected were found among the leafy substrate in woodland ponds. However, one specimen was found among the roots of *Typha* growing in water held in a partially intact basement in the foundation of an old house. The remains of the house except for the small area directly above the foundation were shaded by the surrounding forest.

A living larva of *A. acuductus* is distinguishable immediately from larvae of other known larvae of nearctic dytiscid genera when viewed dorsally by its reddish-yellow head contrasting with the very dark gray thoracic and abdominal segments. Unfortunately, the attractive coloration fades in preserved specimens.

Although we attempted to rear the larvae to the imago, we were unsuccessful and the larvae were preserved after they died.

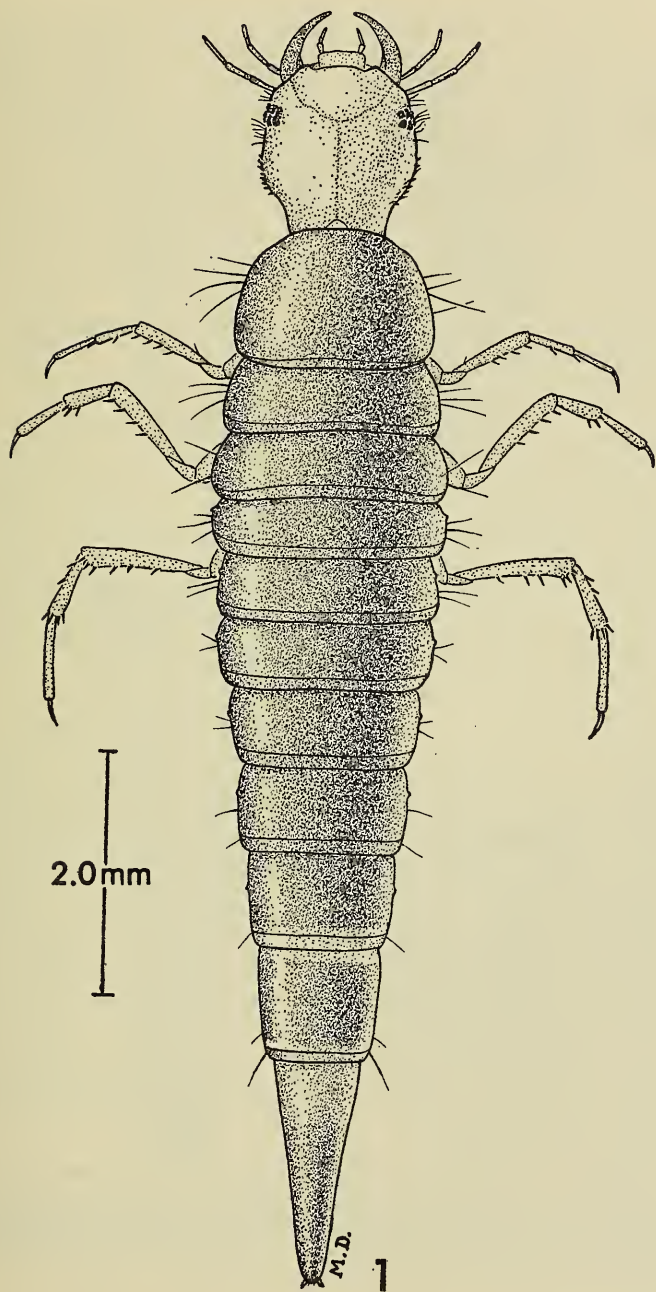
Description of the Third-Instar Larva of
Agabetes acuductus (Harris)
Figures 1-4

Length, 11.0 mm; greatest width of pronotum, 1.6 mm. Color of head testaceous except ocelli black; thoracic segments and abdominal segments 1 through 7 dark infuscate; 8th abdominal segment testaceous at basal third and at apex, intermediate area dark reddish brown. Ventral surface of head testaceous; thoracic sterna and abdominal sterna of segments 1 through 4 and narrow medial area of segment 5 creamy white. Legs light testaceous. Last abdominal segment colored ventrally as described for its dorsal surface.

Head subquadrate, narrowed basally. Labroclypeus evenly arcuate,

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FIG. 1. *Agabetes acuductus*, larva, habitus, dorsal view.



with a row of setae along anterior margin. Ecdysial cleavage line distinct and united at base of head, abruptly forked at apical third of head; frontal arms sinuate laterally, terminating at bases of mandibles in front of antennal insertions. Dorsal surface of head weakly alutaceous; with 3 long slender setae on posterior margin of ocular region and 23 to 25 stout temporal setae. Ventral surface of head (Fig. 2) also weakly alutaceous; with 4 or 5 long slender setae along apicoventral margin of ocular region and a few short stout setae basally and mediad of temporal setae; with 2 large tentorial pits, 1 on each side of midline at apical third of head. Ocular areas oval, each with 6 large ocelli in 2 close vertical rows; lowermost ocellus of each row more widely separated from middle ocelli than upper and middle ocelli are from each other.

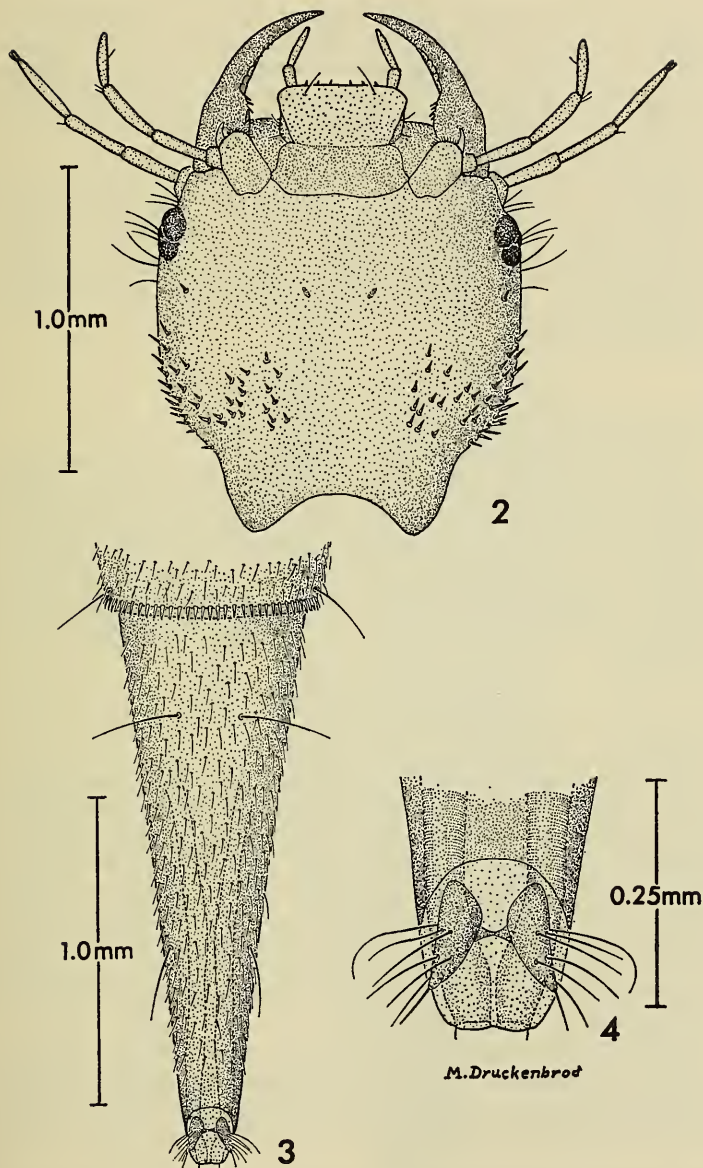
Antenna cylindrical, 4 segmented, glabrous; 1st, 2d, and 3d segments subequal; 4th segment short, about $\frac{1}{6}$ as long as penultimate segment, with a stout seta arising from apex of penultimate segment beside it.

Mandible falciform, stout at base, slender and tapering to sharp apex, deeply grooved along inner surface, and bearing a cluster of short setae ventrobasally. Maxilla with stipes broad; stipes with brushlike, incurved setae and 2 small incurved teeth apicomediaally; galea elongate, hooklike. Maxillary palpus slender, glabrous, elongate, 4 segmented; basal segment (palpifer) shortest, about $\frac{1}{4}$ as long as 2d segment; 2d and 4th segments subequal; 3d segment slightly longer than 2d and 4th segments. Labium large, rectangular, broad, with scattered asperities and 4 small setae on anterior margin between palpi; ligula absent. Labial palpi robust, glabrous, 2 segmented; basal segment shortest, about $\frac{1}{2}$ as long as ultimate segment.

Pronotum twice as broad as long; anteromedial region slightly prolonged; lateral margins strongly rounded and bearing 11 or 12 long slender setae. Mesonotum slightly wider than and almost half as long as pronotum; with 2 or 3 short setae laterally; spiracle present in pleural region beneath anterolateral angle of sclerite. Metanotum slightly wider than and about as long as mesonotum; setation similar to mesonotum.

Legs slender, elongate, 5 segmented; coxa long; trochanter about a third as long as coxa; femur about as long as tibia and tarsus combined; tarsus with 2 elongate, slender claws, outer (upper) claw shorter than inner claw. Foreleg with coxa bearing 1 short stout seta on ventromedial surface, 3 or 4 small setae apically on ventromedial margin, and 8 or 9 setae on ventrolateral margin; trochanter bearing 2 or 3 long slender setae ventroapically; femur with 1 stout seta dorsobasally, 7 stout setae along ventral surface, and 5 or 6 setae encircling apex; tibia bearing 2 stout setae ventroapically and 5 or 6 setae encircling apex; tarsus bearing 2 stout setae dorsoapically.

Abdomen of 8 segments. Segments 1 through 5 sclerotized dorsally, membranous ventrally (5th segment narrowly so); segments 6 through 8 completely sclerotized, ringlike. Terga of all abdominal segments bearing many small setae over surface and along posterior margins and 2 or



FIGS. 2-4. *Agabetes acuductus*, larva, ventral view: 2, head; 3, last abdominal segment; 4, cerci.

3 very long slender lateral setae. Segment 8 (Fig. 3) prolonged posteriorly and bearing 2 very short stout cerci (Fig. 4) ventroapically. Each cercus with 3 long setae at midlength and 4 setae subapically. Lateral margins of segments 1 through 7 each with a spiracle; spiracles on 6th and 7th segments small and ventrolateral instead of lateral as in preceding segments.

The following larval specimens of *A. acuductus* were available for examination. MARYLAND: Anne Arundel County: Friendship, 9 June 1968, P. J. Spangler, 2 specimens. Talbot County: Easton, 5 July 1971, R. D. Gordon, 5 specimens.—VIRGINIA: Accomack County: Chincoteague National Wildlife Refuge, 7 May 1972, J. L. Cross, 2 specimens. Prince William County: Prince William State Park, 26 Sept. 1970, R. D. Gordon, 1 specimen.

Genus *Laccornis* Des Gozis

Laccornis Des Gozis, 1914:111.

The genus *Laccornis* includes 10 species primarily from the cooler regions of the world. Five species are known to occur in the United States. Fall (1923) reports *L. conoideus* (LeConte) from British Columbia, Canada, to New England. Other species of *Laccornis* are known to occur from Maine to Calhoun County, Florida, west to Illinois and Indiana. Also, two species of *Laccornis* are known from Europe, two from southern South America, and one from the mountains of Central Africa.

Laccornis difformis (LeConte)

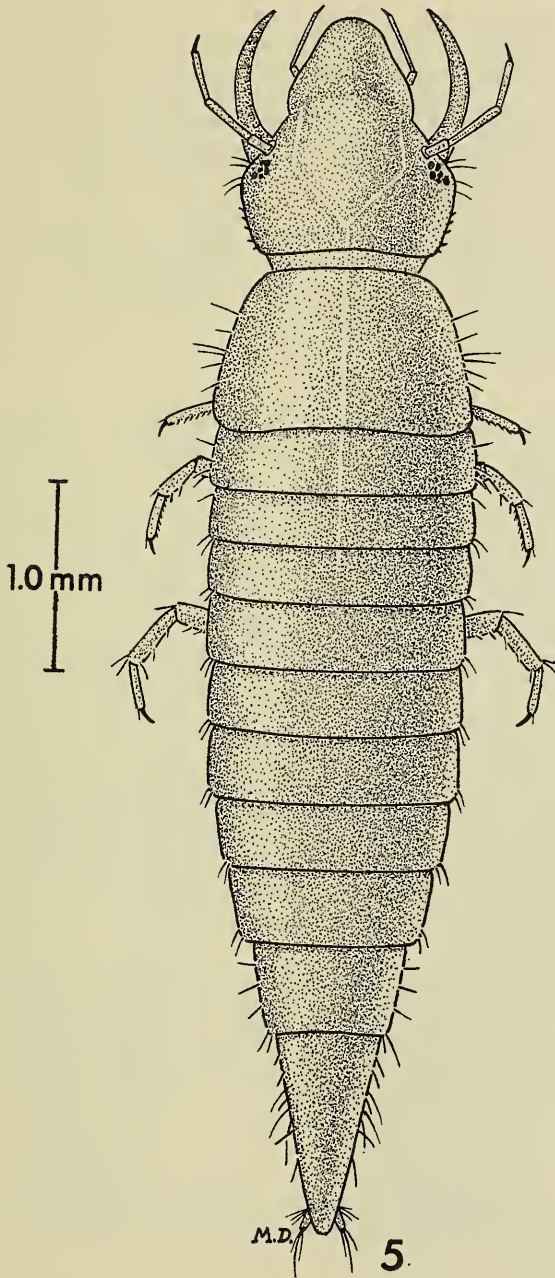
H[ydroporus] difformis LeConte, 1855:298.

Bionomics: North American members of the genus *Laccornis*, like those of *Agabetes*, are inhabitants primarily of woodland ponds. Sherman (1913) discussed their habitat preference and our collections confirm his observations. We collected larvae and adults of *Laccornis* on several occasions during May of 1965 and May of 1967 from a woodland pond on the mainland near Plummers Island, Montgomery County, Maryland. The pond was in dense woods and was well shaded. Larvae were found among leaves along the margins of the pond. Kirk (1969) reported an adult *Laccornis difformis* from Sardis, South Carolina, that was collected "in hollow tree."

The South American species of *Laccornis* occur in the southern temperate to cold regions of Chile and Argentina. Specimens from Chile are found abundantly in weedy roadside ditches and in shallow weedy ponds in open fields. Perhaps specimens of *Laccornis* may be found

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FIG. 5. *Laccornis difformis*, larva, habitus, dorsal view.



also in woodland ponds in Chile but this has not been confirmed. According to the data of reported localities from which *Laccornis* has been collected in Argentina, those specimens must have occurred in shallow ponds in the short grass pampas and these areas are not forested.

Adult specimens of *L. difformis* have fully developed metathoracic wings and probably are capable of flight. However, we know of no specimens collected at light so we assume they are not attracted readily to it.

The larva of *Laccornis conoideus* (LeConte) was described briefly by Watts (1970) and the genus was included in a key to the larvae of the dytiscid genera of the world by Bertrand (1972). The pupa of *Laccornis* has not been described previously. The larva (Fig. 5) and pupa (Figs. 8, 9) of *Laccornis difformis* (LeConte) are described below.

Description of the Third-Instar Larva of
Laccornis difformis (LeConte)

Figures 5-7

Length, 8.20 mm; greatest width of pronotum, 1.33 mm. Color of integument white; dorsal sclerites of thorax and abdomen yellowish brown, small yellow maculae on all segments except 7th and 8th abdominal segments. Head yellowish brown except nasale and maculae yellow; ventral surface of head and mouthparts pale yellow. Legs white except base of coxae at point of articulation black.

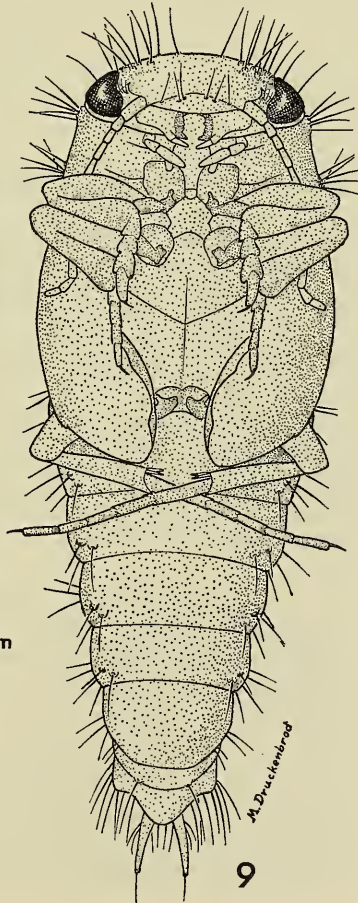
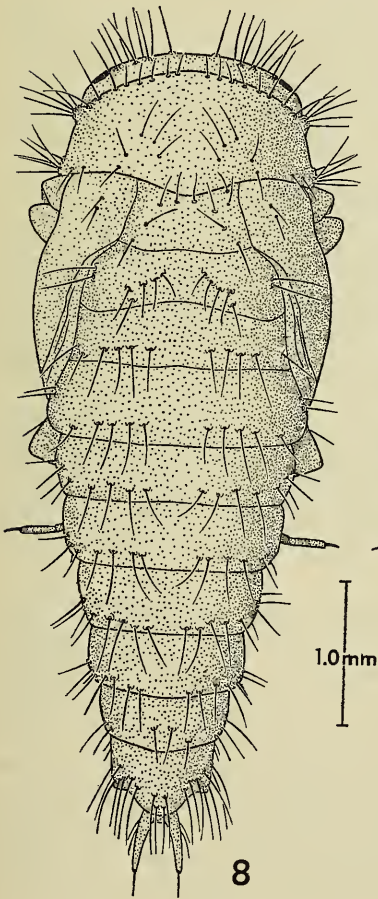
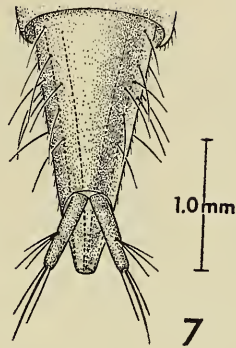
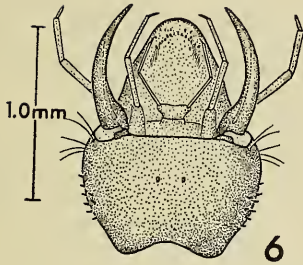
Head ovate with clypeus prolonged to a broad and bluntly rounded nasale. Nasale with dorsal surface glabrous; anterior margin curved downward, edge serrate, with 3 rows of spatulate setae of varying lengths. Ventral surface of nasale with a semicircular row of setae; setae long and slender laterally and clusters of 2 to 4 short, stout setae medially. Dorsal surface of head glabrous except some fine hairs near bases of antennae and ocular areas. Ecdysial cleavage line united at base and forked at basal $\frac{1}{4}$ of head; frontal arms curving laterally to area between ocular areas, then anteriorly to base of nasale. Lateral margins of head with 5 to 8 short stout setae behind each ocular area. Ventral surface of head (Fig. 6) glabrous. Ocular areas each with 6 ocelli in 2 vertical rows of 3 ocelli.

Antenna 4 segmented; 2d and 3d segments longest, subequal; ultimate segment smallest, less than $\frac{1}{4}$ as long as penultimate segment; basal segment less than $\frac{1}{2}$ as long as penultimate segment; segments glabrous except for a single short seta near apex of penultimate segment.

Mandible long, slender, falciform, curved upward and inward apically,

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FIGS. 6-9. *Laccornis difformis*: 6, larva, head, vv; 7, larva, last abdominal segment, vv; 8, pupa, dv; 9, pupa, vv. dv = dorsal view; vv = ventral view.



A. Dreckerling

grooved along inner surface. Maxillary stipes short, stout. Maxillary palpus slender, elongate, 4 segmented; 2d and 3d segments subequal in length; 2d segment more than twice as long as 1st segment; ultimate segment $\frac{1}{4}$ as long as penultimate segment; all segments glabrous. Labium triangular with 2 or 3 setae on each side dorsally; ligula absent; labial palpus 2 segmented, 2d segment $\frac{3}{4}$ as long as 1st segment.

Pronotum subquadrate, wider basally; with 1 large seta and several small setae laterally and a few small setae along hind margin at lateral angles. Mesonotum wider than and less than half as long as pronotum; with setae on lateral margin and on hind margin at lateral angles; a spiracular opening present in pleural region below anterolateral angles of sclerite. Metanotum similar to mesonotum.

Legs 5 segmented; coxa long; trochanter $\frac{1}{4}$ as long as coxa; femur as long as tibia and tarsus combined; tarsus with 2 slender claws, outer claw shorter than inner claw. Coxa with 1 large seta and several small setae on upper surface and several small setae on ventral surface. Trochanter with 1 seta on ventral surface. Femur with a row of setae on posterior edge. Tibia with a row of small setae on posterior edge, large setae around apex. Tarsus with a row of small setae on posterior edge, large setae around apex.

Abdomen of 8 segments. Segments 1 through 6 with dorsal sclerites; segments 7 and 8 completely sclerotized, ringlike. Terga of segments 1 through 6 with short appressed setae on entire surface. Segment 7 with short appressed setae on entire segment and 1 long erect seta laterally. Segment 8 (Fig. 7) cone shaped, posterior end bluntly pointed with 2 short cerci arising ventrally; short appressed setae over surface, several long erect setae on each lateral margin. Cercus with 3 long lateral setae and 4 long terminal setae. Lateral margins of segments 1 through 7 each with a spiracle.

This larva is typically hydroporine in appearance with the nasale present and the mandibles slender, curved upward and inward apically. In Chandler's (1956) key to the known larvae of Nearctic genera the larva of *Laccornis* keys to couplet 3, *Hydroporus* and *Hygrotus*. The following couplet will separate *Laccornis* from *Hydroporus* and *Hygrotus*.

Cerci on 8th abdominal segment long, as long as or longer than 8th segment	<i>Hydroporus</i> and <i>Hygrotus</i>
Cerci on 8th abdominal segment short, $\frac{1}{4}$ as long as 8th abdominal segment	<i>Laccornis</i>

Table 1 shows the results of four rearing attempts. In addition to the four larvae listed in Table 1, the following larval specimens also were available for examination. All larvae studied were from Maryland, Montgomery County, on the mainland near Plummers Island and with the following data: 9 May 1965, R. D. Gordon, 8 specimens; 6 May 1967, P. J. Spangler, 3 specimens; 13 May 1967, P. J. Spangler, 21 specimens.

TABLE 1. Rearing data for pupation of *Laccornis difformis* (LeConte).

Larva No.	Date larva Collected	Date Pupated	Preserved Date	Date Eclosed	Days in Pupation
1	6 V 1967	12 V 1967	16 V 1967	—————	—
2	6 V 1967	19 V 1967	22 V 1967	—————	—
3	6 V 1967	22 V 1967	22 V 1967	—————	—
4	13 V 1967	18 V 1967	—————	22 V 1967	5

Description of the Pupa of *Laccornis difformis* (LeConte)

Figures 8, 9

Length, 5.00 mm; greatest width, 2.80 mm; color white except eyes black; glabrous except for setae described below.

Head with 28 setae arranged as follows: 5 between each eye and vertex, 5 in a group at lower anterior corner of each eye, 1 lateromedially, 6 on anterior clypeal margin.

Pronotum with 52 setae arranged as follows: 26 on anterior margin, 18 on posterior margin, 4 on each side of median line on disc.

The dorsum of some of the remaining segments has some groups of setae with unequal numbers on opposite halves of the pupa; a numerical formula is used that gives the number of setae in each group from the left side of the segment to the right side. First and last numbers refer to lateral groups and the middle numbers refer to groups on each side of the median line. When only two numbers are given they refer to lateral groups. The arrangement of the setae is as follows: Mesonotum, 2-4-6-2; metanotum, 2-5-5-2; 1st abdominal segment, 2-4-4-1; 2d and 3d abdominal segments, 3-4-4-3; 4th abdominal segment, 3-4-4-1; 5th abdominal segment, 3-4-4-4; 6th abdominal segment, 3-4-4-3; 7th abdominal segment, 2-1-2-3; 8th abdominal segment, 9-10. Abdominal segment 9 terminating in 2 cerci slightly longer than length of 8th abdominal segment; cerci each with 1 apical and 2 basolateral setae. Abdominal segments 1 through 5 each with 2 setae on ventrolateral margin; abdominal segment 6 with 1 seta on ventrolateral margin. 1st through 6th abdominal segments each with a pair of spiracles.

Antenna extending obliquely outward basally, then curving down to lie below elytron, nearly parallel to body axis. Legs extend outward at right angles from body axis. Tibiae of first 2 pairs of legs folded against femora; tarsi turned backward parallel with body axis. Femur and tibia of each hind leg not folded against each other; femora directed obliquely away from midline; tarsi almost parallel with body axis.

Variations: The number of setae on the mesonotum of all three pupae examined was different, ranging from a total of 9 to 16. The number of setae on the dorsum of the abdominal segments was fairly constant; the fourth abdominal dorsum seems to have a normal complement of 3-4-4-3;

fifth abdominal, 3-4-4-3; seventh abdominal, 4-2-2-4; eighth abdominal, 9-9.

The pupa illustrated had been in the pupal stage for 4 days and probably would have eclosed within 24 hours. The age of the pupa may explain the advanced stage of development of the segmentation of the appendages.

Genus *Matus* Aubé

Matus Aubé, 1836:189.

The genus *Matus* occurs only in the Western Hemisphere and includes four species and two subspecies from the eastern half of the United States. In the most recent review of the genus, Young (1953) reports that species of *Matus* occur from Massachusetts to Florida on the east coast and to Illinois, Arkansas, and south to Texas. To this distribution we can add Maine, Iowa, and Missouri.

Matus bicarinatus (Say)

C[olymbetes] bicarinatus Say, 1823:98.

Bionomics: Sherman (1913) reported that *Matus bicarinatus* (Say) is another inhabitant of woodland ponds. Most of our specimens of *Matus* were collected in that type of habitat, but we have found *Matus* in other habitats such as unshaded roadside drainage ditches, in a muddy pool of water in the bottom of an old canal, and in a tree-bordered, largely unshaded pond in a field close to a wooded area. Young (1954) said he believes that *M. ovatus blatchleyi* Leech breeds in woods ponds or flatwoods situations in Florida and that adults migrate into many other types of situations. Young also found *M. leechi* Young along the edges of flatwoods streams and in emergent vegetation in these streams.

Specimens of *Matus* are fully winged and they have been collected at ultraviolet lights. However, they are among the less common genera of aquatic beetles collected at lights.

Adults of *Matus* are collected commonly, but the larvae are not often found, perhaps because of the burrowing habit described by J. Balfour-Browne (1947). Balfour-Browne described the peculiar pseudochelate legs of the larva of *Matus* and discussed the function of these legs and the behavior of the larva but did not discuss other structural details. Also, Peterson (1960) illustrated and briefly described the larva of *Matus* sp.

The larva described below is presumed to be that of *M. bicarinatus* because the pseudochelate structure of the tarsi of the front and middle legs identifies the larva as *Matus*; and adult specimens of only one species, *M. bicarinatus*, were taken on many occasions from the pond. In this paper we describe the larva (Fig. 10) of *M. bicarinatus* in detail and place it in Chandler's (1956) key to the known larvae of the nearctic dytiscid genera.

Description of the Third-Instar Larva
of *Matus bicarinatus* (Say)

Figures 10-16

Length, 11.0 mm; greatest width of pronotum, 1.60 mm. Color of integument white; dorsal sclerites of thorax and abdomen brown with yellow maculae on all segments except 7th and 8th abdominal segments; lateral margins of thoracic segments yellow. Head brown except along basal portion of ecdysial cleavage line, around ocular area, 2 median spots, and small posterolateral maculae yellow; ventral surface of head and mouthparts yellow. Legs yellowish white except base of coxae at point of articulation black.

Head subquadrate, slightly narrower posteriorly; anterior margin broadly curved and a fringe of setae hanging downward from median area. Ecdysial cleavage line united at base and forked between ocular areas; frontal arms curve laterally and terminate anterior to antennae. Dorsal surface of head glabrous except for 12 to 16 fine hairs along anterior margin and 5 or 6 fine hairs around ocular area. Ventral surface of head (Fig. 11) glabrous except for 3 to 5 long hairs around ocelli, a row of 5 or 6 long stout black setae and 5 to 8 tiny black setae laterally posterior to ocular area, and a long stout seta on each side of middle near posterior margin; tentorial pit present on each side of midline anteromedially. Ocular areas each with 6 ocelli in 2 close vertical rows of 3 ocelli.

Antenna 4 segmented; 2d and 3d segments longest, subequal; ultimate segment smallest, less than $\frac{1}{4}$ as long as penultimate segment; basal segment slightly more than half as long as penultimate segment; all segments glabrous.

Mandible long, stout, falciform, grooved along inner surface. Maxilla with stipes narrow (Fig. 12); stipes with 2 short reddish-brown setae anteromedially and 1 stout black seta on inner margin near apex; galea elongate, hooklike. Maxillary palpus (Fig. 12) slender, elongate, 4 segmented; basal segment (palpifer) shortest; 2d and 3d segments subequal in length; ultimate segment $2\frac{1}{2}$ times as long as basal segment; 3d segment with 1 long hair anterolaterally; other segments glabrous. Labium (Fig. 13) broadly triangular, with a row of 4 stout black setae and 1 small black seta on each side anterodorsally, with a small black seta ventrally at base of palpus; ligula absent; labial palpus slender, 2 segmented.

Pronotum subquadrate, wider basally, with a fringe of fine hairs laterally and 4 setae on posterior angle. Mesonotum slightly wider than and a little more than half as long as pronotum; with a few setae dorsally and several long setae on lateral margins and posterior angle; a spiracular opening present in pleural region below anterolateral angle of sclerite. Metanotum slightly wider than and about as long as metanotum, with similar setation.

Fore- and midlegs short, stout, 5 segmented; coxa long; trochanter

about $\frac{1}{2}$ as long as coxa; inner apex of tibia with a long serrated process parallel to and as long as tarsus; tarsus with inner margin serrate, 2 claws at apex, inner claw long, outer claw short (Figs. 14, 15). Foreleg (Fig. 14) with coxa with a row of setae on inner margin, 1 seta medially near inner margin; femur with a row of short setae on dorsal (anterior) margin and a row of long setae on ventral (posterior) margin, without row of swimming hairs; tibia with a few short setae ventrolaterally. Midleg (Fig. 15) with coxa with a row of 8 to 10 short stout spines on dorsal (outer) margin, ventral (inner) margin with short stout spines scattered unevenly; femur with a row of long spines on ventral (inner) margin and a row of 9 short spines ventrolaterally, a row of very long swimming hairs interspersed with short setae present on dorsal (outer) margin; tibia with 9 or 10 short stout spines on ventrolateral surface and long swimming hairs on dorsal (outer) margin. Hind legs long, slender; coxa with a row of short setae on dorsal (outer) margin, short setae scattered on ventral (inner) margin and lateral surface; femur with short setae laterally and on dorsal (outer) margin and a few long swimming hairs on dorsal margin, long stout setae on ventral (inner) margin; tibia with a row of stout setae near dorsal (outer) margin, dorsal margin with long swimming hairs, ventral (inner) margin with 2 rows of stout setae, lateral surface with 10 to 12 stout setae near dorsal margin; tarsus with long swimming hairs on dorsal (outer) margin, stout spines on ventral (inner) margin and on lateral and medial surfaces.

Abdomen of 8 segments. Segments 1 through 6 with dorsal sclerites; segments 7 and 8 completely sclerotized, ringlike. Terga of segments 1 through 6 with setae on lateral margins, across hind margins and sparsely on surface; setae mostly short, appressed; a few long erect setae present. Segments 7 and 8 with short appressed setae intermixed with short, stout, erect spines and long erect setae. Segment 8 (Fig. 16) with 2 short slender cerci posteroventrally. Cerci with 8 long erect setae as illustrated. The pleura and venter of segments 1 through 6 covered with short appressed setae with an occasional long erect seta present. Lateral margins of segments 1 through 7 each with a spiracle.

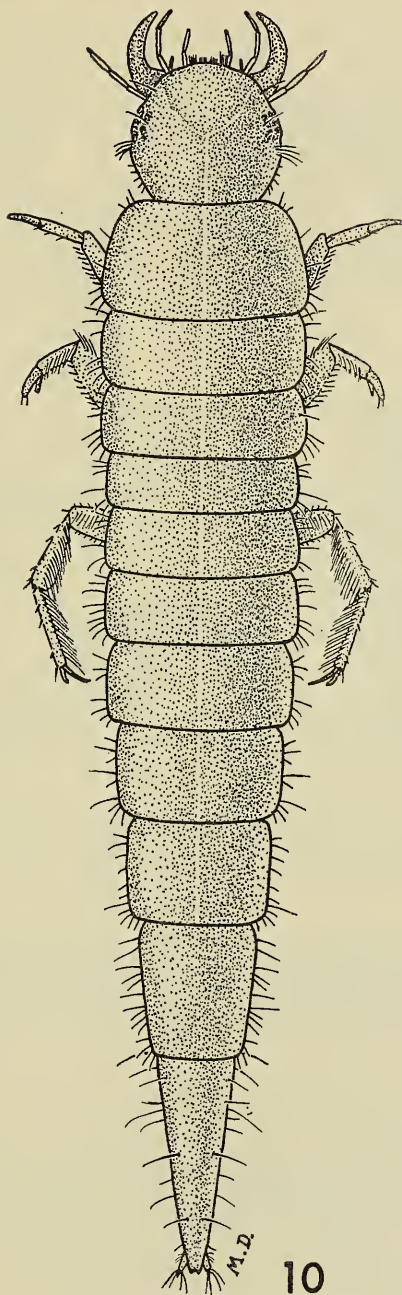
Matus is a member of the Colymbetinae and keys to couplet 10 in Chandler (1956), but does not fit either choice there. It may be separated from both parts of couplet 10 and all known larvae of dytiscid genera by the pseudochelate structure of the fore- and midlegs.

Our larvae of *Matus bicarinatus* were collected in a small partially shaded pond with clumps of grass, algae, and some *Sagittaria* growing in the water along part of the margin of the pond. The rest of the margin of the pond was heavily shaded by trees and shrubs and had little or no low herbaceous vegetation in this area. The *Matus* larvae were

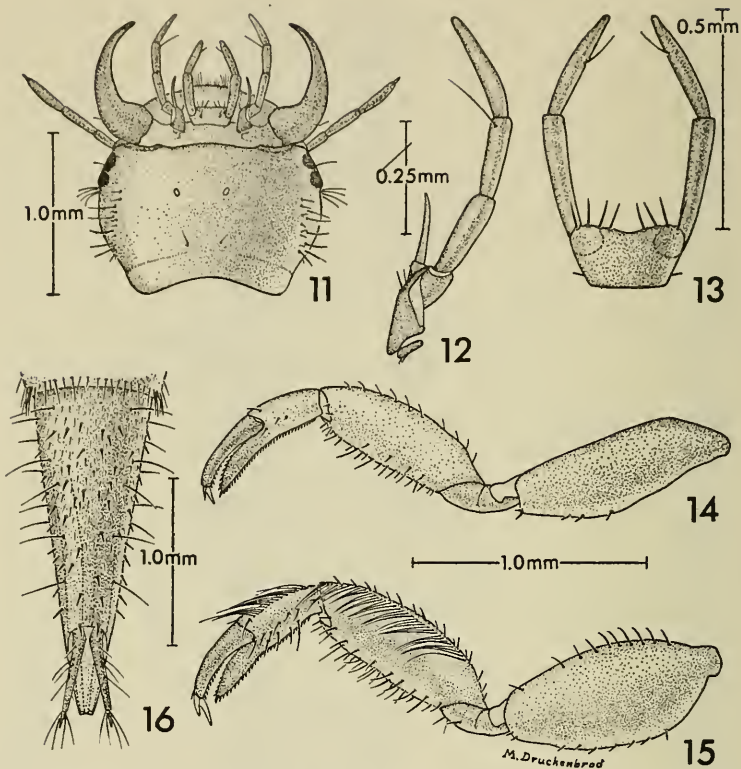
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FIG. 10. *Matus bicarinatus*, larva, habitus, dorsal view.

1.0mm



M.D. 10



FIGS. 11-16. *Matus bicarinatus*, larva: 11, head, vv; 12, maxilla, vv; 13, labium, dv; 14, foreleg, dv; 15, midleg, dv; 16, last abdominal segment, vv. vv = ventral view; dv = dorsal view.

found in muck in the exposed grassy area. An attempt was made to rear the larvae to obtain pupae and the adults, but the larvae died and were then preserved for study. Our five larvae of *Matus* were collected from Maryland, Anne Arundel County, Friendship, 9 June 1968 and 26 July 1970.

LITERATURE CITED

AUBÉ, CHARLES. 1836. Hydrocanthares. *In*: Dejean, *Icon. hist. nat. Coleop. Europe.* 5:xi + 415. Paris, France; Mequignon-Marvis.
 BALFOUR-BROWNE, JACK. 1947. On the False-Chelate Leg of an Aquatic Beetle Larva. *Proc. Roy. Ent. Soc. London* 22(4-6): 38-41.
 BERTRAND, HENRI. 1972. Larves et Nymphes des Coleopteres Aqua-

- tiques du Globe. 804 pp., 561 figs. Abbeville, France:F. Paillart.
- CHANDLER, HARRY P. 1956. Key to the Known Nearctic Genera of Dytiscidae, Larvae. In: Aquatic Insects of California, pp. 312-314. Berkeley and Los Angeles:University of California Press.
- CROTCH, GEORGE R. 1873. Revision of the Dytiscidae of the United States. Trans. Amer. Ent. Soc. 4:383-424.
- DES GOZIS, M. 1914. Tableaux de determination des Dytiscides, Noterides, Hyphydrides, Hygrobiides et Haliplides de la faune franco-rhenane. Misc. Ent. 21:81-128.
- FALL, HENRY C. 1923. A Revision of the North American Species of *Hydroporus* and *Agaporus*. 129 pp. Mt. Vernon, New York: John D. Sherman, Jr.
- HARRIS, THADDEUS W. 1829. Contributions to Entomology. No. VI. New England Farmer 7(21):164.
- JACKSON, DOROTHY J. 1956. Dimorphism of the Metasternal Wings in *Agabus raffrayi* Sharp and *A. labiatus* Brahm (Col., Dytiscidae) and its Relation to Capacity for Flight. Proc. Roy. Ent. Soc. London (A)31(1-3):1-11.
- KIRK, VERNON M. 1969. A List of the Beetles of South Carolina, Part 1—Northern Coastal Plain. Tech. Bull. 1033, South Carolina Agri. Expt. Sta., Clemson University, Clemson, South Carolina, 124 pp.
- LECONTE, JOHN L. 1855. Analytical Table of the Species of *Hydroporus* found in the United States with Descriptions of New Species. Proc. Acad. Nat. Sci. Philadelphia 7:290-299.
- LEECH, HUGH B. 1942. Dimorphism in the Flying Wings of a Species of Water Beetle, *Agabus bifarius* (Kirby) (Coleoptera: Dytiscidae). Ann. Ent. Soc. America 35:76-80.
- PETERSON, ALVAH. 1960. Larvae of Insects, An Introduction to Nearctic Species. Part II. Fourth edition:416 pages. Ann Arbor, Michigan:Edwards Brothers, Inc.
- SAY, THOMAS. 1823. Descriptions of Insects of the Families of Carabici and Hydrocanthari of Latreille, Inhabiting North America. Trans. Amer. Philos. Soc. (New series) 2:1-109.
- SHERMAN, JOHN D., JR. 1913. Some Habits of the Dytiscidae. Jour. New York Ent. Soc. 21:43-54.
- WATTS, CHRISTOPHER H. S. 1970. The Larvae of some Dytiscidae (Coleoptera) from Delta, Manitoba. Canadian Ent. 102(6): 716-728.
- YOUNG, FRANK N. 1953. Two New Species of *Matus*, with a Key to the Known Species and Subspecies of the Genus. (Coleoptera: Dytiscidae). Ann. Ent. Soc. America 46(1):49-55.
- . 1954. The Water Beetles of Florida. Univ. Florida Studies, Biol. Sci. Ser. 5(1):x + 238 pages.